SHOUT
SHARE
IT

EXPERIMENT
STATION LIBRARY

Class 639.73

Number N53

Volume 3 cop 2

Source Binding

Received July 1909

Cost

Accession No. 15435

Bulletin 111 April, 1904

NEW HAMPSHIRE COLLEGE
Agricultural Experiment Station

Ten Experiments with POTATOES AND POTATO CULTURE

FOR NEW ENGLAND

BY F. WM. RANE AND H. F. HALL

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM

FIG. 2.—Potato Trial Grounds at the New Hampshire College.

EXPERIMENTS WITH POTATOES.

F. WM. RANE AND H. F. HALL.

The potato and potato culture has claimed the attention of the Horticultural Department of this Experiment Station continuously in recent years, and knowing the great importance of this crop in New Hampshire we offer the following experiments in addition to those already published in previous reports and bulletins.[1]

I. Ready-mixed *vs.* Home-mixed Fertilizers . Page 109
II. N. Y. and N. J. Formula *vs.* N. H. Formula " 111
III. Amount of Potash to Use per Acre . . " 114
IV. All Fertilizer in Hill *vs.* One Half in Hill and One Half Broadcast . . . . . " 115
V. With *vs.* Without Barnyard Manure . . " 116
VI. Plowing *vs.* Harrowing in Barnyard Manure " 117
VII. Commercial Fertilizer Above *vs.* Below Seed " 119
VIII. Description of Varieties . . . . " 120
IX. Variety Test . . . . . " 125
X. Modern Culture . . . . . " 126

Experiment I.

Comparative Results from Home-mixed Commercial Fertilizers and Standard Potato Manures (fertilizers) Found on the Market.

This experiment was the outcome from inquiry as to which method was more economical. Quantities of the so-called potato manures are sold throughout New England for potato

[1] Nos. 41, 48, 63, 73, and 79.

growing, and the experiment was thought of sufficient importance to give it a test.

In order to make the comparative conditions uniform the basis of the experiment rests upon the analysis of one of the standard kinds, viz., that of the Stockbridge Potato Manure. The analysis of this fertilizer is: nitrogen, 3 per cent.; phosphoric acid, 6 per cent.; and potash, 10 per cent. A formula was then made up of our own which contained the same proportions of plant food as the above and was composed of the following ingredients:

3 per cent. nitrogen { 150 lbs. nitrate of soda.
112½ lbs. sulphate of ammonia.
6 per cent. phosphoric acid, 562½ lbs. bone black.
10 per cent. potash, 300 lbs. muriate of potash.

In order to give the same bulk some makeweight material was used so that conditions would be the same.

Fifteen hundred (1,500) pounds per acre of each fertilizer was used upon land that was under every other condition the same. The soil was of medium loam and of newly-turned-under sod. The soil was well prepared for receiving the crop. One half the fertilizer was sown broadcast and well harrowed; the remainder was drilled in the hills. The distance apart of the rows, culture, spraying, etc., were similar in every respect, and conformed to the general principles outlined in potato culture as recommended in previous bulletins of this Station and in Experiment X of this treatise. The season proved good, and the test was a fair one from every standpoint.

At harvest time the resulting yields were as follows:

KIND.	Yield per Acre—Bushels.		
	Large.	Small.	Total.
Stockbridge Potato Manure	279⅓	60	339⅓
Home-mixed	272	70⅔	342⅔

From the above it will be seen that there was little difference in yield. If anything it was in favor of the standard mixture or ready-made potato manure.

Comparison of Cost.

The fertilizers were both purchased on the market at regular prevailing prices. As the ready-mixed kinds came all ready for preparation, one dollar ($1.00) is added to the cost of the home-mixed fertilizer.

The following table shows the comparative cost per acre :

KIND.	COST PER ACRE.	COST PER BUSHEL.	
		Total.	Large Potatoes.
Stockbridge Manure.....	$28.50	$0.08 3/10	$0.10 1/5
Home-mixed.....	19.82	.05 7/10	.07 1/5

It is evident from the above experiment that while the yield remains about equal, there is a saving of approximately $8.68 per acre where home mixing is practised.

Prices of commercial fertilizers have changed of late, and using the present prices, which would represent our present conditions (the spring of 1904), the difference per acre of saving would be $7.10. Stockbridge Special Manure is quoted at $36.50 per ton, or using 1,500 lbs. per acre = $27.38. With current prices for chemicals the home mixture would cost $19.28 plus $1 for mixing = $20.28.

EXPERIMENT II.

Comparison between the New York and New Jersey Home-mixed Formula and that of New Hampshire.

Many experiments have been carried on in the states of New York and New Jersey on determining the best proportions of commercial fertilizers for potato culture. The following mixture seems to be the one most commonly adopted and recommended by the Experiment Stations of these respective states: Nitrogen, 3.9 per cent; phosphoric acid, 8 per cent.; and potash, 10 per cent. The ingredients used are as follows:

Nitrogen, 3.9 per cent. . . .	150 lbs. nitrate of soda. 180 lbs. sulphate of ammonia.
Phosphoric acid, 8 per cent. .	750 lbs. bone black.
Potash, 10 per cent. . . .	300 lbs. muriate potash.
	120 lbs. makeweight.
Total	1,500 lbs.

Unsprayed. *Sprayed.*

FIG. 3.—Results showing the effect of Spraying Potatoes.

The New Hampshire mixture, which is made up to comply with the usual elements used, namely, nitrogen, 3 per cent., phosphoric acid, 6 per cent., and potash, 10 per cent., was as follows:

Nitrogen, 3 per cent. . . .	150 lbs.	nitrate of soda.
	112½ lbs.	sulphate of ammonia.
Phosphoric acid, 6 per cent.	565½ lbs.	bone black.
Potash, 10 per cent. . . .	300 lbs.	muriate potash.
	375 lbs.	makeweight.
Total	1,500 lbs.	

The culture and conditions in this experiment were the same excepting the amounts of commercial fertilizers above indicated.

At harvest time the results were as follows:

KIND.	YIELD PER ACRE—BUSHELS.		
	Large.	Small.	Total.
New York and New Jersey mixture.....	280⅔	64	344⅔
New Hampshire mixture.....	272	70⅔	342⅔

From the above it is shown that there was little difference in the total yield, but the experiment favored the New York and New Jersey mixture both in number of large potatoes and in total yield.

Comparison of Cost.

The difference in the cost of the two fertilizer mixtures is easily figured out. The New York and New Jersey mixture contained 67½ lbs. each of sulphate of ammonia, and 197½ lbs. of bone black more than the other mixture, which at the usual rate would cost $5.33. If we divide this by the number of bushels that the New York formula produced over the other, or 8⅓ bushels of marketable potatoes, the cost per bushel for the excess would be 64 cents.

From this experiment we would conclude that considering everything, the New Hampshire mixture is of equal value to that of the New York and New Jersey formula.

Experiment III.

How Much Potash can be Used Economically on a Potato Crop?

In carrying out this experiment four plots were set aside and each handled in every respect similarly to those already alluded to. The formula taken as a basis was: 3 per cent. nitrogen, 8 per cent. phosphoric acid, and 10 per cent. potash.

All four plots contained the same amount of nitrogen and phosphoric acid, but differed in the amount of potash.

Plot No. 1 contained no potash.

Plot No. 2 contained 5 per cent. potash.

Plot No. 3 contained 10 per cent. potash.

Plot No. 4 contained 15 per cent. potash.

The comparative yield of each plot was as follows:

PLOT.	Amount Potash per Acre.	Yield per Acre—Bushels.		
		Large.	Small.	Total.
1	None	234⅔	81⅓	316
2	5 per cent. (150 lbs.)	264⅔	72	336⅔
3	10 per cent. (300 lbs.)	280⅔	64	344⅔
4	15 per cent. (450 lbs.)	292⅔	56⅔	349⅓

From this data it is shown that the larger amount of potash had some bearing upon an increase in yield. The question now to settle is whether this extra application produced enough larger yield to pay for the extra expense of the potash.

COMPARATIVE COST PER ACRE.

PLOT.	Amount of Potash.	Cost per Acre.	Cost per Bushel.	
			Total.	Large Potatoes.
1	None	$18.55	$0.05⅔	$0.07 9/10
2	5 per cent. (150 lbs.)	21.85	.06⅔	.08⅕
3	10 per cent. (300 lbs.)	25.15	.07⅓	.08 9/10
4	15 per cent. (450 lbs.)	28.46	.08 1/10	.09 7/10

By comparing the above tables we can deduce the following conclusions :

(1) In the first place, without any potash used we were able to raise a fairly good crop of potatoes, which shows that our soils contain a fair amount of available potash.

(2) By the addition of 150 pounds of muriate of potash the yield was increased 30 bushels of marketable potatoes at a cost of $3.22, or approximately 11 cents a bushel.

(3) By using 300 pounds of muriate of potash the yield was increased 46 bushels of marketable potatoes, at a cost of $6.45, or exactly 14 cents a bushel.

(4) When 450 pounds of muriate of potash was used the yield resulted in an increase of 48 bushels of marketable potatoes, at a cost of $9.67, or approximately 20 cents a bushel.

(5) Taking everything into consideration, therefore, labor, culture, etc., when yield and expense are considered, 10 per cent. of potash or 300 pounds of muriate of potash give the best results.

Experiment IV.

Comparative results between applying commercial fertilizer, or so-called potato manure, all in the hill or one-half in the hill and the remainder broadcast.

The method of preparation of the land was exactly the same otherwise.

The fertilizer used was Stockbridge potato manure at the rate of 1,500 pounds per acre. The results were as follows :

PLOT.	How Applied.	Yield per Acre—Bushels.		
		Large.	Small.	Total.
1	Half and half	279⅓	60	339⅓
2	All in hill	281⅓	40⅔	322
3	Half and half	275½	62⅔	338

From this experiment the plots in which the fertilizer was sown one-half broadcast and harrowed in and the remainder placed in the hills, gave the heavier yield. This yield, however, was largely of small or unmarketable tubers. The plot with the fertilizer all applied in the hill gave the largest yield of

large or commercial potatoes. From the standpoint of value there is comparatively little difference shown.

Experiment V.

Comparative results from growing potatoes with and without barnyard manure, other conditions being the same.

The soil selected for this experiment well represented the average cultivated field of New England. It had been stocked down to grass for about five years and needed taking up and handling. The grass crop the previous year was light and about paid for harvesting. The field was plowed up and well fitted. The planting was done on May 21st and crop harvested October 16th. The soil was of a medium clay loam.

The following table gives the comparative results:

Plot.	How Fertilized.		Yield per Acre—Bushels.		
	Barnyard Manure.	Commercial Fertilizer.	Large.	Small.	Total.
1	None	None	141	50	191
2	15 cords	None	268	38	306
3	None	750 pounds	258	32	290
4	15 cords	750 "	365	26	391
5	None	1,500 "	286	29	315
6	15 cords	1,500 "	387	36	423
7	None	2,000 "	200	40	240
8	15 cords	2,000 "	238	51	289

It is evident from the above that in each instance where barnyard manure was used there was an increase in yield of potatoes.

Where barnyard manure alone was used the increase was 127 bushels of marketable potatoes, or 115 bushels in all.

Where barnyard manure plus 750 pounds of commercial fertilizer was used as compared with a plot containing 750 pounds of commercial fertilizer withou barnyard manure, the increase was 107 bushels of marketable potatoes, or 101 bushels total, large and small.

Where the conditions were the same excepting the manure was absent in one plot and 1,500 pounds of commercial fertilizer

was used in each, the increase was 101 bushels of marketable, or 108 bushels large and small, in favor of the plot containing the barnyard manure.

Where a larger amount than the above of commercial fertilizer was used the difference was not as great nor was the yield as good.

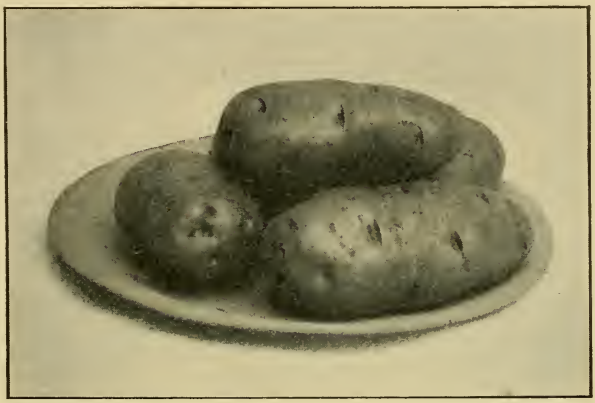

FIG 4.—Early Rose Potato No. 23.

Drawing conclusions from this experiment it is evident that where the conditions are the same as above named, if an application of 15 cords of barnyard manure in addition to the customary application of commercial fertilizer for potatoes is used, the increased yield will be at least 100 bushels of marketable potatoes.

Another thing not to be lost sight of also is the better condition of the soil for succeeding crops which manure is responsible for.

EXPERIMENT VI.

Comparative results from plowing in and harrowing in barnyard manure.

An elaborate experiment was planned for carrying out this test. The plots used were similar in every respect to those of Experiment V, being located in the same field and in every way the same other than the above named culture.

The following table shows the results both of individual plots and their comparative total yield and averages.

PLOT.	Additional Commercial Fertilizer. (Potato Mixture.)	Barnyard Manure—15 Cords per Acre.					
		Plowed In.			Harrowed In.		
		Large bush.	Small bush.	Total bush.	Large bush.	Small bush.	Total bush.
1	None	268	38	306	266	42	308
2	750 pounds	365	26	391	361	26	387
3	1,500 "	387	36	423	385	33	418
4	750 "	374	40	414	378	42	420
5	None	264	35	299	252	39	291
6	750 pounds	365	31	396	330	38	368
7	2,000 "	238	51	289	215	48	263
8	750 "	380	30	410	333	39	372
9	None	264	28	292	254	33	287
Total		2,905	315	3,220	2,774	340	3,114
Approximate average		323	35	358	308	38	346

Fig. 5.—Red American Wonder, Potato No. 99.

Conclusions.—In drawing conclusions from this experiment it is evident that in every instance excepting one, namely, plot 4, the results from plowing under the barnyard manure give a larger yield. Averaging the plots as a whole, the plots plowed under outyielded the others at the rate of 15 bushels per acre of marketable potatoes, or 12 bushels of total, large and small.

Experiment VII.

Comparative results from applying the commercial fertilizer all above the seed in the hill, and the ordinary method of applying it below the seed. Seven hundred and fifty pounds of the potato mixture were used in each plot.

The following table gives the comparative results:

PLOT.	How Applied.	Without Barnyard Manure.			With Barnyard Manure—15 Cords per Acre.		
		Large bush.	Small bush.	Total bush.	Large bush.	Small bush.	Total bush.
1	Below the seed.....	258	32	290	365	26	391
2	Above the seed.....	267	31	298	374	40	414
3	Below the seed.....	260	20	280	365	31	396
4	Above the seed.....	.....	.....	.....	378	42	420
5	Below the seed.....	229	42	271	380	30	410

Conclusion.—(1) This experiment, with a single exception, gives the larger yield in favor of the plots where the commercial fertilizer was applied above the seed.

(2) Where barnyard manure was also used at the rate of 15 cords per acre the yield was 18 bushels per acre larger where the commercial fertilizer was applied above the seed. The average of the two plots with the commercial fertilizer applied above the seed was 417 bushels per acre, while the average of the three plots with the commercial fertilizer applied below was 399 bushels.

(3) Where no barnyard manure was used and only the commercial fertilizer used above as compared with others below, the yield was 298 bushels above as compared with the average of three plots with the fertilizer applied below, 280⅓ bushels, or 18⅓ bushels in favor of the former.

(4) According to results thus obtained in this experiment, the applying of the commercial fertilizer above the seed seems to be of equal importance whether barnyard manure is used or not.

Experiment VIII.

Description of Varieties.

17. *Delaware.*—Season medium early to late. Tubers round and flat; size medium to large; skin white, finely netted; quality excellent. A very strong-growing and heavy-yielding variety. Highly recommended as a main crop variety for home or market use.

23. *Early Rose.*—This potato needs no introduction to New Hampshire growers, having long been the standby for early planting. While new varieties are annually introduced that promise to excel this variety in yield and earliness, yet we are unable, after testing them all, to point out one that has given as good average results in the two above-mentioned respects, provided a good selected strain of seed was used. See Fig. 4.

99. *Red American Wonder.*—Tubers large; color light red; vines large; bloom purple, shape oblong, flattened, somewhat irregular. Inclined to crack on seed end. Not as desirable for market as some of the white-skinned sorts. See Fig. 5.

108. *Wonderful.*—Size medium; shape long and regular; color white heavily overlaid with russet. A fair yielder.

109. *Pingree.*—Shape oblong; color white shaded with pink. Season medium. Tubers somewhat irregular.

110. *Admiral Dewey.*—Season early to medium; shape irregular; color white. Undesirable.

111. *Washington.*—A strong-growing medium to late variety; tubers large and regular; shape oblong, somewhat flattened. It has a very clear, white skin, with a small amount of netting. Quality fair. An attractive and desirable variety for main crop. See Fig. 6.

112. *Erie.*—Early Rose type. Size medium; shape regular. Yields well for an early.

113. *Battle's Best.*—Season medium to late. Tubers large, white, smooth, and regular; shape round to oblong, flattened. A good cropper.

* For other varieties, see descriptions in previous bulletins of this Experiment Station.

114. *Extra Early May.*—Season medium early. Tubers rather uneven in size and shape. Early Rose type.

115. *Evans Beauty.*—Size medium; color pinkish white; season medium early; tubers good size and regular.

116. *Pride of Sunnyside.*—Shape oblong; ends blunt; color light red; eyes deep. Season medium. Similar to the Commercial and Maggie Murphy.

117. *Burbank's Seedling.*—Long, white, smooth, and regular; size medium. Quite subject to rot.

118. *Algonquin.*—Size very large; shape round to oblong, somewhat flattened, smooth, and regular; color white.

119. *Green Mountain.*—A well known variety for main crop. Highly recommended for New Hampshire, as it succeeds well on our soil and is well and favorably known in our markets. Size medium to large; shape oblong, slightly flattened; skin netted, color white; quality excellent. See Fig. on cover.

120. *Ex. Early Pioneer.*—Size small to medium; color white shaded with pink; shape oblong; skin slightly netted. Undesirable.

121. *Market Prize.*—Size medium; color white; skin netted; shape oblong, slightly flattened. Medium in yield and earliness.

122. *Junior Pride.*—An extra early, round, white, medium-sized potato, having small to medium-sized tops. One of the most promising early varieties of recent introduction.

123. *Early Norwood.*—Early Rose type, quite early; size medium. Tops small; yield good for an early. Promising.

124. *Eureka.*—Early; round, slightly flattened; skin smooth and white; size small to medium. Quite productive, and promising as an early.

125. *Up-to-Date.*—A nearly round, white potato; medium in season and yield; tops large, leaf small. Many of the tubers were under size.

126. *Cambridge Russet.*—Tubers elongated, regular, and smooth; size medium; skin heavily overlaid with russet. Season late. A good yielder, but undesirable for commercial use.

127. *Pride of Britain.*—Vines of medium strength; tubers long, smooth, and regular; color white; yield fair.

128. *King of Michigan.*—Vines medium in growth; tubers oblong, flattened; skin white, finely netted. Season second early. An attractive and desirable variety.

129. *Minister.*—Tubers coarse and irregular; shape oval, somewhat flattened; color white shaded with light pink; yield fair. Undesirable for market use owing to the irregular form of the tubers.

130. *Northern Beauty.*—A medium early pink variety of the Rose type. Vines medium in size; tubers smooth, oval, and flat. Worthy of further trial.

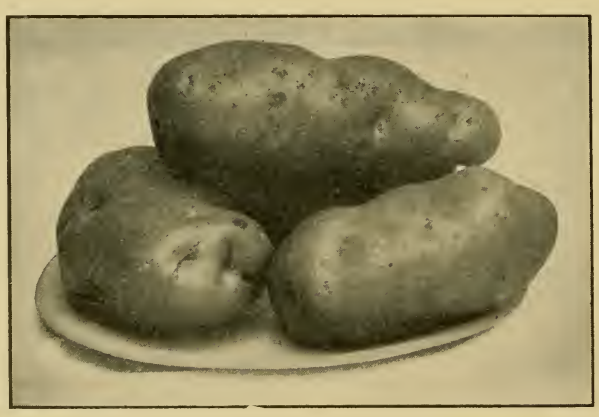

Fig. 6.—Washington, Potato No. 111.

131. *Howes' Early.*—A very early variety similar to the Early Six Weeks; shape round to oblong. This variety gave the lightest yield of any in the test.

132. *Early Peachblow.*—Tubers round and regular; color white mottled with pink; season early. Undesirable.

134. *Colebrook.*—A mid season variety of the Hebron type. Tubers long, smooth, and regular; size large. A good yielder of considerable promise. See Fig. 7.

135. *Coös No.* 2.—Oblong to long; color white; smooth and large. Similar to the White Rose. Promising.

136. *Dewey Rose.*—An excellent second early variety of the Early Rose type. Tubers good size, uniform, and regular. See Fig. 8.

137. *White Giant.*—A strong-growing, late variety, closely resembling the Sir Walter Raleigh, showing the same purple shade in stem and blossom; tubers large, nearly round, and flat; somewhat irregular; color white. A fair cropper.

138. *Adirondack.*—Season late; tubers large, white, round to oblong, smooth and even for so large a potato. Very promising.

141. *Rose of Erin.*—Season early to medium; shape round to oblong; color light red. Many small tubers.

144. *Ontario Early.*—An early white variety, maturing with the Early Rose, but not equal to it in point of yield. It gave a large per cent. of small tubers.

145. *Pride of Hollis.*—Season early to medium. Vines small. Tubers long; color cloudy (similar to Beauty of Hebron).

146. *Colburn's Seedling.*—Season early; tubers long and irregular; a large per cent. were undersize; color pink. Early Rose type.

147. *Sunlight.*—Tubers oblong to long, slightly flattened; skin white and smooth. Medium early; fair yielder.

148. *Million Dollar.*—Similar to the Sir Walter Raleigh. Tubers oblong, flattened, white, smooth, and regular. Of considerable promise.

149. *Oom Paul.*—Color cloudy; shape long and smooth; season late; tubers of the Hebron shape and color. Yield good.

150. *Sensation.*—Oblong to long, smooth and regular; color cloudy; eyes quite deep. Medium in season and yield.

151. *Lee's Favorite.*—A medium early variety; tubers flesh colored clouded with pink; shape long and smooth. A large per cent. of tubers were under market size.

152. *Columbus.*—A long, cloudy potato; somewhat irregular in form. Season medium late. Yield fair.

New Varieties.

153. *Early Surprise.*—A medium early, round, white potato of some promise.

154. *Daybreak.*—This variety is the result of a cross between Seneca Beauty and Polaris. Season medium early; color nearly white; shape oval.

155. *John Bull.*—A new variety of the same origin as Daybreak. Size large; shape oblong to long; color light red; season late.

156. *Vermont Gold Coin.*—A new main crop variety of much promise. Tubers white with tinge of yellow; skin netted, denoting good quality; shape oblong and thick, somewhat irregular.

157. *Victor* (*Vick's No.* 9).—A new early variety that promises well. Size medium; shape nearly round, somewhat flattened; skin nearly white, slightly netted.

159. *Crine's Lightning.*—Shape oblong to long; color pink, marked with lighter stripes and heavily overlaid with russet.

161. *Columbia.*—An early white variety of some promise; shape oblong; color white; skin smooth; eyes shallow.

162. *Old Glory.*—Season late; size medium to large; shape oblong; color red.

163. *Perfection.*—Size small to medium; shape oval, quite irregular; skin flesh color mottled and clouded with deep pink. Undesirable.

164. *Norcross.*—A new late variety that promises to be a heavy cropper. Tubers large; shape oval; color white.

165. *Keeper.*—Season late; shape nearly round, quite irregular; skin smooth and red; eyes prominent; quality poor. Undesirable.

167. *Early Michigan.*—Season early; color white; shape long. Worthy of further trial.

Experiment IX.

Variety Test.

THE AVERAGE COMPARATIVE YIELD OF VARIETIES.

No.	VARIETY.	Yield per Acre—Bushels.		
		Large.	Small.	Total.
17	Delaware	468	38	506
99	Red American Wonder	372	21	393
108	Wonderful	240	26	266
109	Pingree	261	43	304
110	Admiral Dewey	145	19	164
111	Washington	482	24	506
112	Erie	254	28	282
113	Battle's Best	385	19	404
114	Ex. Early May	220	40	260
115	Evans' Beauty	210	32	242
116	Pride of Sunnyside	342	15	357
117	Burbank's Seedling	251	29	280
118	Algonquin	320	14	334
119	Green Mountain	452	19	471
120	Early Pioneer	120	68	188
121	Market Prize	250	19	269
122	Junior Pride	260	37	297
123	Early Norwood	284	49	333
124	Eureka	295	26	321
125	Up to Date	186	53	239
126	Cambridge Russet	280	19	299
127	Pride of Britain	249	19	268
128	King of Michigan	322	34	356
129	Minister	229	40	269
130	Northern Beauty	276	31	307
131	Hewes' Early	102	29	131
132	Early Peachblow	204	32	236
133	Cow Horn	311	24	335
134	Colebrook	386	19	405
135	Coös No. 2	330	26	356
136	Dewey Rose	284	28	312
137	White Giant	307	19	326
138	Adirondack	358	25	383
139	Dakota Red	340	31	371
140	White Brooks	202	48	250
141	Rose of Erin	228	44	272
142	Red Brooks	218	43	261
143	Beauty of Hebron	263	27	290
144	Ontario Early	196	48	244
145	Pride of Hollis	180	19	199
146	Colburn's Seedling	240	50	290
147	Sunlight	213	19	232
148	Million Dollar	201	32	233
149	Oom Paul	299	27	326
150	Sensation	232	24	256
151	Lee's Favorite	193	55	248
152	Columbus	186	28	214

Experiment X.

Modern Culture.

Soil and Location.

The ideal potato soil is deep, friable, retentive of moisture, and well drained. Heavy clay and very light sandy soils should be avoided. Stony land renders planting and cultivating difficult and expensive. The presence of decaying organic matter in the soil not only furnishes valuable plant food but also increases its water-holding capacity. Everything else being equal, a northern slope would be preferred to a southern one, except when grown for early use, as the crop is sometimes badly injured by the intense heat increased by a southern exposure during a hot, dry season.

Fig. 7.—Colebrook, Potato No. 134.

Manure.

Fresh stable manure, especially when harrowed in, tends to produce such diseases as scab, blight, and rot, and should therefore be applied, if possible, to the crop preceding, and enough used to provide for the needs of both crops.

The potato thrives best in a cool, moist soil, and, unlike the corn crop, roots quite deeply. It is therefore recommended that stable manure be plowed in for the above-mentioned reasons, and also to prevent the germination of the weed seeds contained in it, thus greatly reducing the cost of hand cultivation.

When a crop is to be grown on freshly broken sod, the best results will generally be obtained by plowing in a light application of stable manure, and using in the drill 8 to 10 cwt. per acre of a good high-grade fertilizer similar to that used in Experiment I of this Bulletin.

Chemical Fertilizers.

In large potato-producing sections where the supply of stable manure is limited many growers are obtaining splendid results from the exclusive use of chemical fertilizers, using about 1,500 lbs. per acre. Where the physical condition of the soil is poor we should recommend plowing under a crop of clover, peas, or other legumes, and the application of 12 to 15 cwt. per acre of a high-grade fertilizer. In using either stable or chemical manures an excess should be avoided, as it tends to produce an overgrowth of vines, which excludes the air and sunlight, thus favoring the conditions which invite and spread the attacks of the blight.

One hundred bushels of potatoes contain about 12.6 lbs. nitrogen, 4.5 lbs. phosphoric acid, and 30 lbs. potash.

The knowledge of the analysis of the crop is of little value to the grower until he has studied his soil and learned its needs; but knowing both, he will be able to apply at the lowest cost the proper amount of plant food required to produce a full crop.

Preparing the Ground.

The time for plowing will depend largely upon the nature and situation of the field. If infected with quack grass or located upon a slope that is liable to wash, spring plowing would be preferred. If plowed in the fall, an extra amount of harrowing will be necessary in order to obtain the same results as produced by spring plowing. Whatever the time selected for plowing, the soil should be harrowed and pulverized in a thorough manner, not being content with stirring and leveling the surface only, but using such harrows as will work deep and leave the soil in the best condition to receive the crop.

Seed.

Good seed is one of the essentials to success in growing this crop. As the potato decreases in vitality when grown from poor stock, it is best to either select carefully our own seed by

saving the product of such hills as yield the greatest weight of smooth, marketable tubers, or buy from a reliable grower whom we know to be selecting his seed in a like manner.

It is a false idea of economy to save a few dollars per acre by using cheap seed, and thereby ruin your chances of success at the start. The fact that many growers are planting small and indifferent seed, year after year, largely accounts for the low average yield reported, and also for the deterioration of most varieties after eight or ten years in the hands of the average grower.

Small to medium tubers grown from seed selected as already mentioned, that have not lost their vitality by sprouting, will generally produce a more satisfactory crop than larger seed of the same variety grown from a poor strain of tubers that have been weakened by excessive sprouting.

FIG. 8.—Dewey Rose, Potato No. 136.

Varieties. (For description and yield of varieties, see Experiments VIII and IX of this Bulletin.)

As our New England markets demand a round or oblong white potato, we recommend for main crop the planting of such varieties as the Green Mountain and Delaware, or varieties that closely resemble them.

As seedsmen are each year introducing and selling at fabulous prices new and untried varieties, the most of which are soon dropped from their catalogues and forgotten, we advise the New Hampshire growers to depend on standard sorts that have

been fully tested and found adapted to their soil and market, and allow their Experiment Station to test the novelties for them, thus preventing a large annual waste of time and money.

Planting.

The time for planting will depend upon the soil, locality, and season. If wanted for early use, the seed should be planted in April, while for main crop the work may be done between the 1st and 20th of May.

Improved planters are rapidly coming into general use among the large growers, and while their cost prohibits their ownership by the average farmer, the purchase of one is generally recommended in cases where six or more acres are annually planted. Unless great care is taken in cutting the seed to have the pieces uniform in size and shape, and good judgment exercised in operating the machine to secure an even distribution of the seed and fertilizer, also straight rows and proper covering, the advantage of the planter will be lost. The depth for covering should depend upon the nature and condition of the land; in low or clayey soils three inches will be sufficient, while upon light, well-drained land a covering of four inches is advisable.

The distance for planting should be governed by the fertility of the soil and the variety used, as well as by the number of eyes on each piece of seed. A good rule for most conditions is to use seed cut to two or three strong eyes, and plant every 15 to 18 inches, in rows three feet apart.

Cultivation.

This is a very important operation, and must be attended to at the proper time if the crop is to be kept clean and thrifty at a minimum cost. The neglect of a few days in one cultivation may mean the difference between profit and loss. Cultivation should begin by stirring the soil with a weeder or smoothing harrow within one week from time of planting, and the operation repeated every week or ten days as long as the size of plants will admit, the objects sought being to prevent crusting of the surface soil and the extermination of weeds before they have gained foothold in the soil.

The horse cultivator will next be of service in cultivating the crop, and should be run quite deep for the first cultivation, after which all operations should be shallow, as deep cultiva-

tion after the plants have become well established causes untold injury to the roots feeding in the top soil.

The amount of hand hoeing necessary will depend upon the thoroughness of the above operations and the amount of grass and weed seeds in the soil. If the weeding and cultivating has been faithfully done, the only necessary hand work should be in the removal of the scattering weeds along the row.

Diseases.

The principal diseases are the early and late blight and scab.

The *early blight* usually appears from the middle to the latter part of July, during hot, dry weather, and causes a premature dropping of the foliage, but is unattended by rot.

The *late blight* usually appears in August, and spreads very rapidly during warm, moist weather. Its attacks are sudden and destructive, and are usually accompanied by rotting of the tubers.

The above diseases may be prevented by thoroughly spraying with Bordeaux mixture. The first spraying application should be made when the vines are 8 to 12 inches high, which with the late varieties will be about July 15th. The number and frequency of later sprayings will depend largely upon the weather. Usually four to five times will be sufficient, unless washed off by heavy rains, the object being to keep the vines covered with the mixture at all times after the first spraying. To destroy the potato beetle, $\frac{1}{4}$ to $\frac{1}{2}$ pound of paris green should be added to each 50 gallons of mixture. To prevent the scab, avoid contaminated land and seed, also excess of fresh stable manure. Seed that is affected, and smooth tubers that have been selected from affected stock, should be treated with formalin or corrosive sublimate solutions before planting.

A preparation known on the market as Bug Death has been widely recommended as a fungicide and insecticide, but after giving it several trials we have been unable to obtain results that would warrant its general use as either. More extensive trials are contemplated during the coming season.

Acknowledgment. Figures 4, 5, 6, 7, and 8 are from photographs loaned us by Burton A. Corbett, B. S., of Colebrook, N. H., a seed potato specialist, and are good representations of the respective varieties.

639.73 N53 3 cop. 2
N. H. Exp. Sta.
Buls. 97-129
1903-1907.

639.73
N53
v.3 cop 2